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BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte ARTHUR G. RODGERS and MARK A. BUCHANAN

Appeal 2009-002961
Application 10/710,772
Technology Center 2100

Decided: December 30, 2009

Before ST. JOHN COURTENAY III, DEBRA K. STEPHENS, and JAMES R. HUGHES, *Administrative Patent Judges*.

COURTENAY, Administrative Patent Judge.

DECISION ON APPEAL

This is a decision on appeal under 35 U.S.C. § 134(a) from the Examiner's final rejection of claims 1-20. We have jurisdiction under 35 U.S.C. § 6(b). We reverse.

STATEMENT OF THE CASE

THE INVENTION

Appellants' invention relates generally to priority queuing systems used in networked computer systems, such as routers. More particularly, Appellants' invention is directed to a method, computer program product, and queuing system in which blockage of high-priority packets is prevented. (Spec. 1, ¶1).

ILLUSTRATIVE CLAIM

1. A method comprising:

> receiving a plurality of queue items at an input queue, wherein the input queue feeds a plurality of output queues that feed one or more output ports, wherein each of the plurality of queue items has a corresponding queue item priority and a corresponding output port from the one or more output ports, and wherein each of the plurality of output queues at an output port has a corresponding queue priority;
>
> determining whether a particular one of a plurality of output queues contains a number of queue items that meets or exceeds a pre-determined amount; and
>
> in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue.

PRIOR ART

Nakayama	US 6,907,001 B1	Jun 14, 2005
Erimli	US 6,842,423 B1	Jan. 11, 2005
Wynne	US 6,959,002 B2	Oct. 25, 2005

THE REJECTIONS

1. The Examiner rejected claims 1-17, 19, and 20 under 35 U.S.C. § 103(a) as unpatentable over the combination of Nakayama and Erimli.
2. The Examiner rejected claim 18 under 35 U.S.C. § 103(a) as unpatentable over the combination of Nakayama, Erimli, and Wynne.

APPELLANTS' CONTENTIONS

Regarding independent claims 1, 7, and 12, Appellants contend, *inter alia*, that the Examiner's proffered combination of Nakayama and Erimli does not teach nor suggest "in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority *greater than or equal to* the queue priority of the particular one of the plurality of output queues from exiting the input queue," (emphasis added by Appellants in Brief) (App. Br. 5).

Appellants support their contention, as follows:

> The Examiner argues that this feature is taught by Nakayama, since after a particular threshold is reached in Nakayama, all packets are prevented from being transmitted to an output queue. The Examiner reasons that if all packets are

> prevented from being transmitted, then that would mean that packets greater than a particular priority would be suppressed in addition to packets of a lesser priority.
>
> The problem with this argument is that it focuses on possible results of Nakamura and Appellants' invention, while ignoring *what the two inventions do* to obtain those results. Appellants' independent claims recite specific criteria utilized by the claimed invention to select which packets should not exit the input queue, namely that the packets have a priority greater than or equal to the queue priority of their destination output queue. In contrast, Nakayama, even where it teaches suppressing all packets (regardless of priority), applies the opposite criterion, that the priority is less than a particular amount.

(App. Br. 5).

> Moreover, the presently claimed invention also differs from the cited prior art in terms of what values are compared to determine which packets should not exit the input queue. Appellants' independent claims recite that these packets are those "that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues." In the case of Nakayama, the Examiner has correctly noted that Nakayama does not teach output queues having a particular queue priority. The Examiner relies on Erimli as teaching queues having an associated queue priority. However, Erimli does not teach or suggest the limitation of preventing packets having a priority greater than or equal to the output queue's priority from exiting an input queue. The Examiner points to reference characters 312, 314, 316, and 318 in Figure 3 of Erimli as being output queues having associated queue priorities. However, in the event that one of the these queues becomes congested, Erimli teaches that all packets destined for any of queues 312, 314, 316, and 318 (which are all associated with a single output port) will be subject to flow control, regardless of what those packets' priority levels are. The circuit in Figure 4 of Erimli, for instance, performs a logical OR (reference symbol 430) of flow control signals from each of priority queues 312, 314, 316, and 318 to generate a

> flow control signal that applies to all four priority queues on a "per output port" basis. *See* cols. 7 and *8* of Erimli. Thus, in Erimli, flow control is initiated on a "per output port" basis rather than on a particular packet's priority.
>
> Thus, neither reference, whether considered apart or in conjunction with one another, teaches or suggests the claimed feature of preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that have a queue item priority *greater than or equal to* the queue priority of the particular one of the plurality of output queues from exiting the input queue.

(App. Br. 7, emphasis in original).

EXAMINER'S RESPONSE

The Examiner points to Nakayama's columns 4 and 5, as follows:

> Columns 4 and 5 of Nakayama state that "the quantity of stored cells destined for a specified output port exceeds a predetermined threshold value within the switch, the input line interfaces sending the cells destined for the specified output port selectively inhibits the forwarding or sending out of cells according to the order of priority of the cells in response to the notice of congestion informed to each of the input line interfaces from the congestion notifier 4 by way of the signal line 19" (Column 4, lines 54-62) and "upon reaching a second threshold Th2, the high priority cells destined for the specified output port are also prohibited from flowing into the switching unit 3" (Column 5, lines 2- 5). Because Nakayama prevents the high priority queue items in addition to the low priority queue items when Th2 is reached, the limitation that high priority queue items are blocked is taught by Nakayama. Moreover, because Nakayama blocks the high priority queues at Th2 (they were not blocked at Thl) the condition of greater than or equal to is met at Th2 because the high priority queue items are blocked in addition to the low priority queue items (i.e. now less than, equal to, and greater than are all met). (emphasis in original). (Ans. 27).

ISSUE

Based upon our review of the administrative record, we have determined that the following issue is dispositive in this appeal:

> Have Appellants shown the Examiner erred in finding that the combination of Nakayama and Erimli teaches or would have suggested the argued limitations of
>
> > "in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and *that have a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues from exiting the input queue*?"
>
> (*See* independent claims 1 and 7 and the commensurate language recited in independent claim 12, emphasis added).

PRINCIPLES OF LAW

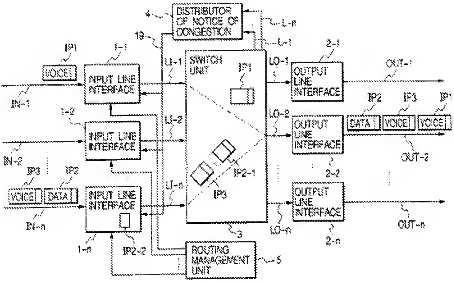
The question of obviousness is resolved on the basis of underlying factual determinations including (1) the scope and content of the prior art, (2) any differences between the claimed subject matter and the prior art, and (3) the level of skill in the art. *Graham v. John Deere Co.*, 383 U.S. 1, 17-18 (1966). "What matters is the objective reach of the claim. If the claim extends to what is obvious, it is invalid under § 103." *KSR Int'l Co. v. Teleflex, Inc.*, 550 U.S. 398, 419 (2007).

FINDINGS OF FACT

THE NAKAYAMA REFERENCE

1. Nakayama's Figure 1 depicts a packet switch unit, as reproduced below:

FIG. 1



2. Nakayama teaches a packet switch where variable length packets received from input lines (IN-1, IN-2, IN-n) are converted to fixed length cells by each input line interface (1-1, 1-2, 1-n). (Col. 3, ll. 1-4; col. 4, ll. 32-35; Fig. 1).

3. Nakayama teaches that each input line interface (1-1, 1-2, 1-n) comprises a buffer memory 12 for temporarily storing the IP packet received from the input line. (Col. 6, ll. 33-35, Fig. 2).

4. Nakayama teaches "cell queues [are] formed for each output port in the switching unit 3 . . . " (Col. 4, ll. 64-65) where buffer memory 323 is provided for queuing of the cells within switching unit 3 as shown in Fig. 5. (Col. 8, ll. 36-37, Fig. 5).

5. Nakayama teaches that the input cells are switched from the input ports (LI-1, LI-2, LI-n) to any one of the output ports (LO-1, LO-2, LO-n) *specified by the routing information contained in each of the cell headers*. (Col. 4, ll. 37-39; Fig. 1, emphasis added).

6. Nakayama teaches that when "the quantity of stored cells destined for a specified output port exceeds a predetermined threshold value within the switch, the input line interfaces sending the cells destined for the specified output port selectively inhibits the forwarding or sending out of cells according to the order of priority of the cells in response to the notice of congestion informed to each of the input line interfaces from the congestion notifier 4 by way of the signal line 19" (Col. 4, lines 54-62).

7. Nakayama teaches

> In the congestion control process, a plurality of threshold values may for instance be assigned to the cell queues formed for each output port in the switching unit 3, and at the point where the quantity of the stored cells for a specified output port reaches a first threshold value Th1, the low priority cells destined for the specified output port [are] prohibited from flowing into the switching unit 3 and upon reaching a second threshold value Th2, the high priority cells destined for the specified output port [are] also prohibited from flowing into the switching unit 3 and once the number of cells stored for the specified output port has sufficiently decreased due to prohibiting the supply of cells to the switching unit, the suppression of the input of cells to the switch unit may be canceled to once again allow the cells to flow into the switching unit 3 in the order of high priority cells first. (Col. 4, l. 63 through col. 5, l. 11).

8. Nakayama teaches that when suppression is canceled, cells normally flow into the switching unit 3 in order of high priority cells first. (Col. 5, ll. 5-11).

THE ERIMLI REFERENCE

9. Erimli teaches a plurality of output queues (310) where each queue has a particular priority (queue 312-low priority, queue queue 314-medium low priority, queue 316-medium-high priority, 318-high priority). (Col. 7, ll. 4-21).

10. Output queues 310 generate threshold signals that may be used to perform flow control in switch 180. When the number of items of a particular priority in an output queue 310 exceeds the threshold, the output queue 310 generates a threshold signal. (Col. 7, ll. 22-28).

11. Erimli's Figure 3 depicts a plurality of output queues (310), as reproduced below:

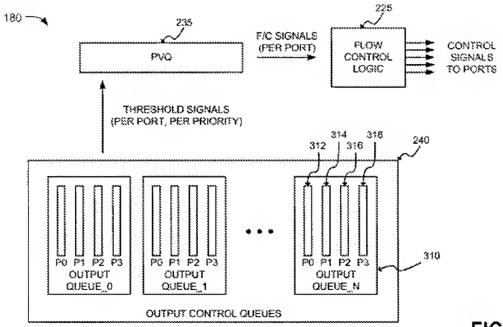


FIG. 3

ANALYSIS

We decide the question of whether Appellants have shown the Examiner erred in finding that the combination of Nakayama and Erimli teaches or would have suggested the argued limitations of "in response to a determination that the particular one of the plurality of output queues contains a number of queue items that meets or exceeds the pre-determined amount, preventing any queue items that have a same corresponding output port as the particular one of the plurality of output queues and that *have a queue item priority greater than or equal to the queue priority of the*

particular one of the plurality of output queues from exiting the input queue." (*See* independent claims 1 and 7 and the commensurate language recited in independent claim 12, emphasis added).

In addition to the principal argument presented above, Appellants aver that "Appellants' claims, like all apparatus and method claims, define the invention in terms of how the invention is made or practiced — that is, the structure and operation of the invention. If Appellants claim something that applies a 'greater than or equal to' relation and the prior art teaches only something that applies a 'less than' relation without teaching or suggesting the use of a 'greater than or equal to' test or criterion, then the structure and operation of Appellants' invention and the prior art differ, even if it is possible to define a hypothetical situation in which the two inventions will yield identical results." (App. Br. 6-7).

The crux of Examiner's argument essentially amounts to a finding that if all the items in an input queue are suppressed or blocked from exiting the queue (as taught by one embodiment of Nakayama – FF 7), then all queue items with a priority greater than or equal to a particular priority are also blocked from exiting the input queue. Therefore, because the *same result is realized*, the argued limitations of the independent claims on appeal are fully met. (*See* Ans. 27).

We disagree, and find the Examiner's reasoning flawed for essentially the same reasons argued by Appellants in the Brief. (App. Br. 6-7). As an analogous example, we consider a hypothetical process claim that recites a method of painting a house the color red using a paint brush. A prior art reference that achieves the *same result* by using a power paint sprayer to paint a house red does not fairly teach the claimed method that paints the

house red using a different process that utilizes a paint brush. *Cf. Southwall Technologies, Inc. v. Cardinal IG Co.*, 54 F.3d 1570, 1579 (Fed. Cir. 1995) ("An accused product that does not literally infringe a claim may infringe under the doctrine of equivalents if 'it performs substantially the *same function* in *substantially the same way* to obtain the *same result*.'" quoting *Graver Tank & Mfg. Co. v. Linde Air Prods. Co.,* 339 U.S. 605, 608 (1950)) (emphasis added).

We note that each of the independent claims before us on appeal recites an *input queue* and a *plurality of output queues*. (Claims 1, 7, and 12). The Examiner is reading the claimed input queue on any one of Nakayama's input line interfaces (1-1, 1-2, 1-n) (FF 2, Fig. 1), that each contain a buffer memory 12 (input queue) for temporarily storing the IP packet received from the input line (FF 3, Fig. 2). The Examiner is reading the claimed plurality of output queues on "cell queues formed for each output port in the switching unit 3 . . . . " where Nakayama teaches that buffer memory 323 (an output queue) is provided for queuing of the cells within switching unit 3, as shown in Fig. 5. (FF 4). We note that Nakayama teaches that the variable length packets received from input lines (IN-1, IN-2, IN-n) are converted to fixed length cells by each input line interface (1-1, 1-2, 1-n) (FF 2).

We particularly note that the argued comparison recited in each of Appellants' independent claims is between a *queue item priority* and a *queue priority of the particular one of the plurality of output queues*. (Claims 1, 7, and 12). The Examiner looks to the secondary Erimli reference as teaching output queues each having a corresponding queue priority. (Ans. 7; *see also* FF 9-11).

As pointed out by the Examiner, Nakayama teaches "at the point where the quantity of the stored cells for a specified output port reaches a first threshold value Th1, the low priority cells destined for the specified output port [are] prohibited from flowing into the switching unit 3 and upon reaching a second threshold value Th2, the high priority cells destined for the specified output port [are] also prohibited from flowing into the switching unit 3." (FF 7).

Thus, we find Nakayama teaches that when the second threshold value "Th2" is attained, all cells destined for a specified output port are prohibited from flowing from an input queue (located in the input line interface) into an output queue (located within switching unit 3). Thus, *in this instance, all cells are blocked from exiting the input queue.*

In reviewing the Nakayama reference, we find no specific comparison between a queue item priority (associated with one of Nakayama's cells) that corresponds to a particular output queue priority, wherein each of the plurality of output queues at an output port has a corresponding queue priority. Instead, the portion of Nakayama pointed to by the Examiner merely teaches that each cell (i.e., queue item) waiting in an input queue has either a low or high priority (FF 7). We also find that Nakayama teaches that each cell has *routing information contained in the cell header* that designates a particular output port. (FF 5).

Thus, Nakayama teaches a comparison between the number of items in an output queue and the threshold values Th1 and Th2 that each designate how full the output queue is. We find this teaching merely meets the claimed limitation of "determining whether a particular one of a plurality of output queues contains a number of queue items that meets or exceeds a pre-

determined amount." (*See* Claim 1, and the commensuration language recited in claims 7 and 12).

Thus, we find the aforementioned portions of Nakayama relied on by the Examiner do not teach nor fairly suggest the argued comparison between "a queue item priority greater than or equal to the queue priority of the particular one of the plurality of output queues," as claimed. (*Id.*).

While the Examiner looks to the secondary Erimli reference as teaching wherein each of the plurality of output queues at an output port has a corresponding queue priority (Ans. 7; *see also* FF 9-11), we are persuaded by Appellants' argument, as follows:

> Erimli does not teach or suggest the limitation of preventing packets having a priority greater than or equal to the output queue's priority from exiting an input queue. The Examiner points to reference characters 312, 314, 316, and 318 in Figure 3 of Erimli as being output queues having associated queue priorities. However, in the event that one of the these queues becomes congested, Erimli teaches that all packets destined for any of queues 312, 314, 316, and 318 (which are all associated with a single output port) will be subject to flow control, regardless of what those packets' priority levels are. The circuit in Figure 4 of Erimli, for instance, performs a logical OR (reference symbol 430) of flow control signals from each of priority queues 312, 314, 316, and 318 to generate a flow control signal that applies to all four priority queues on a "per output port" basis. *See* cols. 7 and *8* of Erimli [particularly col. 7, ll. 39-41]. Thus, in Erimli, flow control is initiated on a "per outputport" basis rather than on a particular packet's priority.[1]

(App. Br. 7, emphasis in original).

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[1] See particularly Erimli, col. 7, ll. 39-41: "The PVQ 235 operates upon the threshold signals from the output queues 310 and generates flow control (F/C) signals on a <u>per output port</u> basis." (emphasis added).

We also find the Examiner's responsive argument (addressing Appellants' arguments regarding the Erimli reference, Ans. 27, last paragraph through p. 28, first paragraph) to be unconvincing, because the Examiner states that *Nakayama* was relied on as teaching the limitation of preventing packets having a priority greater than or equal to the output queue's priority from exiting an input queue. (*Id.*). This statement appears to contradict the Examiner's previously stated reliance on the secondary Erimli reference as teaching that each of the plurality of output queues at an output port has a corresponding queue priority. (Ans. 7; *see also* FF 9-11).

Because we find Appellants have met the burden of showing error in the Examiner's prima facie case of obviousness, we reverse the Examiner's rejection of independent claims 1, 7, and 12 as being unpatentable over the combination of Nakayama and Erimli. Because we have reversed the Examiner's rejection of each independent claim on appeal, we also reverse the Examiner's rejections of the dependent claims on appeal.

CONCLUSION

Based on the findings of facts and analysis above, we find Appellants' arguments persuasive that the Examiner erred in rejecting claims 1-20 as being obvious over the cited prior art under 35 U.S.C. §103(a).

DECISION

We reverse the Examiner's decision rejecting claims 1-20 under 35 U.S.C. § 103(a).

REVERSED

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